TECHNICAL REPORT SERIES
CANADIAN WILDLIFE SERVICE

This series of reports, established in 1986, contains technical and scientific information from projects of the Canadian Wildlife Service. The reports are intended to make available material that either is of interest to a limited audience or is too extensive to be accommodated in scientific journals or in existing CWS series.

Demand for these Technical Reports is usually confined to specialists in the fields concerned. Consequently, they are produced regionally and in small quantities; they can be obtained only from the address given on the back of the title page. However, they are numbered nationally. The recommended citation appears on the title page.

Technical Reports are available in CWS libraries and are listed with the DOBIS system in major scientific libraries across Canada. They are printed in the official language chosen by the author to meet the language preference of the likely audience. **To determine whether there is significant demand for making the reports available in the second official language, CWS invites users to specify their official language preference. Requests for Technical Reports in the second official language should be sent to the address on the back of the title page.**

SÉRIE DE RAPPORTS TECHNIQUES
DU SERVICE CANADIEN DE LA FAUNE

Cette série de rapports donnant des informations scientifiques et techniques sur les projets du Service canadien de la faune (SCF) a démarré en 1986. L'objet de ces rapports est de promouvoir la diffusion d'études s'adressant à un public restreint ou trop volumineuses pour paraître dans une revue scientifique ou l'une des séries du SCF.

Ordinairement, seuls les spécialistes des sujets traités demandent ces rapports techniques. Ces documents ne sont donc produits qu'à l'échelon régional et en quantités limitées; ils ne peuvent être obtenus qu'à l'adresse figurant au dos de la page titre. Cependant, leur numérotage est effectué à l'échelle nationale. La citation recommandée apparaît à la page titre.

Ces rapports se trouvent dans les bibliothèques du SCF et figurent aussi dans les listes du système de référence DOBIS utilisé dans les principales bibliothèques scientifiques du Canada. Ils sont publiés dans la langue officielle choisie par l'auteur en fonction du public visé. **En vue de déterminer si la demande est suffisamment importante pour produire ces rapports dans la deuxième langue officielle, le SCF invite les usagers à lui indiquer leur langue officielle préférée. Il faut envoyer les demandes de rapports techniques dans la deuxième langue officielle à l'adresse indiquée au verso de la page titre.**

Cover illustration is by R.W. Butler and may not be used for any other purpose without the artist's written permission.

L'illustration de la couverture est une œuvre de R.W. Butler. Elle ne peut dans aucun cas être utilisée sans avoir obtenu préalablement la permission écrite de l'auteur.

A SURVEY OF MOULTING CANADA GEESE IN THE BATHURST INLET AND BACK RIVER AREAS, NORTHWEST TERRITORIES:1986

Kevin J. McCormick
Canadian Wildlife Service

Robert G. Bromley
GNWT Department of
Renewable Resources

Technical Report Series No.80
Western and Northern Region
Canadian Wildlife Service

This series may be cited as:

McCormick, K. and R. Bromley. 1990.
A survey of moulting Canada geese in the
Bathurst Inlet and Back River areas,
Northwest Territories: 1986.
Technical Report Series No.80,
Canadian Wildlife Service,
Western and Northern Region

Issued under the authority of the
Minister of Environment
Canadian Wildlife Service

©Minister of Supply and Services Canada 1990
Catalogue No. CW69-5/80E
ISBN 0-662-17304-x
ISSN 0831-6481

Copies may be obtained from:

Canadian Wildlife Service
P.O. Box 637
Yellowknife, NWT
Canada X1A 2N5

90-06288/1

ABSTRACT

A survey of moulting Canada Geese was conducted from 11-13 July, 1986. The objectives of the study were: 1) to determine the distribution and abundance of moulting Canada Geese in the vicinity of Bathurst Inlet and along the Hood, Western, Hiukitak, Ellice, and Back rivers, 2) to evaluate the importance of Key Habitat Sites in the study area, and 3) to record ancillary observations on other wildlife in the study area.

A total of 32,031 Canada Geese yielded an estimate of 74,000 birds within the surveyed area. The approximate distribution of birds observed was: Back River system - 27,420; Ellice River - 3,250; Hiukitak River - 464; Bathurst Inlet - 73; and inland areas - 824. This total is over three times the number of birds observed in 1984. Also, the geese were more widely distributed along the survey route than during the previous survey. It appears that the concentration (and distribution) of Canada Geese was a direct response to the late spring of 1986. As many of the upland ponds and lakes were ice-covered, geese concentrated in areas with escape habitat - open water. Also, the moulting geese were probably augmented by a number of non-breeding birds which resulted from the late spring.

Concentrations of Lesser Snow Geese were recorded at: lower Ellice River - 245, Back River system from 103°30'W to the east end of Upper Gary Lake - 2,146, and lower Back River - 618. Six previously unknown colonies were discovered within the study area. It is suspected that these colonies resulted from the poor habitat conditions (snow cover) at traditional breeding sites in Queen Maud Gulf Bird Sanctuary.

RÉSUMÉ

Un recensement de Bernaches du Canada en mue a été effectué entre le 11 et le 13 juillet 1986. Ses objectifs étaient de: 1) déterminer la distribution et l'abondance des bernaches dans la région de Bathurst Inlet et des riviéres Hood; Western, Hiukitak, Ellice, et Back, 2) évaluer l'importance des sites déjà reconnus comme exceptionnels (Key Habitat Sites) dans cette région, et 3) recueillir toute observation d'oiseaux et de mammiféres d'intérêt particulier.

Nous avons dénombré 32,031 Bernaches du Canada, ce qui nous permet d'évaluer le total de bernaches à environ 74,000 pour la région. Pas moins de 27,420 bernaches ont été observées dans le bassin de la rivière Back, 3,250 en bordure de la rivière Ellice, 464 en bordure de la rivière Hiukitak, 73 à Bathurst Inlet, et 824 à d'autres endroits. Plus de trois fois plus de bernaches qu'en 1984 ont été dénombrées. Les bernaches étaient également plus éparpillées en raison, semble-t-il, du printemps tardif. De nombreux lacs et étangs étaient encore couverts de glace, ce qui obligea les bernaches à se concentrer en bordure des plans d'eau libre, où elles peuvent échapper aux prédateurs. Il semble aussi que le nombre habituel de bernaches ait été gonflé par la présence de non-nicheurs.

Des Petites Oies blanches ont été aperçues dans le bas de la rivière Ellice (245), le bassin de la rivière Back, entre 103°30'W de longitude ouest et l'extrémité est du lac Upper Garry (2,146), et le bas de la rivière Back (618). Six colonies de Petites Oies blanches ont été découvertes. Il pourrait s'agir de colonies nichant normalement dans le Refuge d'oiseaux de Queen Maud Gulf qui se sont installées un peu plus au sud, là où cette année, les conditions de nidification (moins de neige) sont plus favorables.

ACKNOWLEDGEMENTS

This project was made possible through the generous logistical support provided by Polar Continental Shelf Project. A helicopter was provided for the survey and a Twin Otter aircraft was made available for caching fuel.

Our appreciation is also due to the following:

Dale Ross and Derek Curtis generously granted access to the Inland Waters Directorate cabins along the Back River.

Val Jackson accommodated us in her field camp at Hood River.

Dick Kerbes and Len Shandruk provided valuable comments and criticisms on the report.

Marek Molozzi and Karen Zelinski typed the manuscript and Susan Popowich prepared the figures.

Marc Hutcheson, the helicopter pilot, provided excellent service.

TABLE OF CONTENTS

Pages

ABSTRACT.....i
RÉSUMÉ.....ii
ACKNOWLEDGEMENTS.....iii
LIST OF FIGURES.....vi
LIST OF TABLES.....vi
LIST OF APPENDICES.....vi
1.0 INTRODUCTION.....1
1.1 Key Habitat Sites.....1
1.2 Objectives.....1
2.0 STUDY AREA.....2
3.0 METHODS.....2
4.0 RESULTS.....4
4.1 Canada Geese.....4
4.1.1 Distribution and Abundance.....4
4.1.2 Breeding Distribution.....6
4.2 Lesser Snow Geese.....6
4.2.1 Distribution and Abundance.....6
4.2.2 Breeding Distribution.....6
4.3 Significant Ancillary Observations.....8
4.3.1 Falcons.....8
5.0 DISCUSSION.....8
5.1 Regional Spring Weather.....8
5.2 Canada Geese.....9
5.2.1 Distribution.....9
5.2.2 Abundance.....12
5.2.2.1 Back River System.....13
5.2.2.2 Ellice River.....14
5.2.3 Influence of Spring Weather.....14
5.2.4 Key Habitat Sites.....15
5.2.4.1 Ellice River.....15
5.2.4.2 Middle Back River.....15
5.2.4.3 Lower Back River.....15
5.2.5 Breeding Distribution.....16

5.3 Lesser Snow Geese.....16
5.3.1 Distribution and Abundance.....16
5.3.1.1 Ellice River.....16
5.3.1.2 Middle Back River.....17
5.3.1.3 Lower Macdougall Lake.....18
5.3.1.4 Lower Back River.....18
5.3.2 Influence of Spring weather.....18
6.0 LITERATURE CITED.....20
7.0 APPENDICES 21

LIST OF FIGURES

Figure — Page

1. Location of the study area within the NorthwestTerritories.....3

2. Distribution of moulting Canada Geese along the survey route, July 1986.....5

3. Location of Arctic Canada snowline on 7 June, 1986.....10

LIST OF TABLES

Table — Page

1. Water levels and break-up dates on the Ellice, Baillie, and Back rivers; 1986.....11

LIST OF APPENDICES

Appendix — Page

1. Route of moulting goose survey, July 1986.....21

2. Summary of bird observations, July 1986.....27

3. Summary of mammal observations, July 1986.....36

4. Number of moulting Canada Geese observed on the same transect units, 1984 and 1986.....39

1.0 INTRODUCTION

1.1 Key Habitat Sites

The Canadian Wildlife Service (CWS) recently completed a compilation (McCormick et al. 1984) of the key migratory bird terrestrial habitat sites in the Northwest Territories (NWT). Any site which supports at least one percent of the Canadian population of a migratory bird species or subspecies, for any portion of the year, is considered to be a key habitat site. Evaluations are based upon the best available estimates of national and regional populations and the number of individuals present at each site. Some of the site-specific data are out-dated and of variable quality. Sites, therefore, have been ranked with regard to updating the appropriate information and will be systematically surveyed as financial and personnel resources permit.

The Back River system was initially surveyed in 1984. The rationale for surveying this site and the 1984 results were presented in McCormick and Arner (1986). This report presents the results of a 1986 survey. Adjustments which were made to the 1986 survey route, in light of the 1984 survey, are discussed in appropriate sections of this report.

1.2 Objectives

The objectives of this study were:

1) to determine the distribution and abundance of moulting Canada Geese in the vicinity of Bathurst Inlet and along the Hood, Western, Hiukitak, Ellice, and Back rivers.

2) to evaluate the importance of key habitat sites in the study area.

3) to record ancillary information on other wildlife in the study area.

2.0 STUDY AREA

The study area includes portions of the northeast District of Mackenzie and the northwest District of Keewatin, Northwest Territories. The nearest communities are Cambridge Bay, Gjoa Haven, Baker Lake, Coppermine, and Bathurst Inlet (Fig. 1). Most of the Ellice River occurs within the Queen Maud Gulf Bird Sanctuary whereas parts of the Baillie and Back rivers represent the western and northern boundaries, respectively, of the Thelon Game Sanctuary.

The physiography, surficial geology, and vegetation of the study area were discussed in an earlier report (McCormick and Arner 1986). For more details on these topics and a discussion of glacial lake and marine submergence in the study area, refer to the above-noted report.

3.0 METHODS

The survey was flown, from 11-13 July 1986, in a Bell 206-B helicopter at approximately 30 m agl and about 160 km/h. Speed was reduced when necessary to facilitate observations, and to verify our data. Two observers, in addition to the pilot, were present. One individual occupied the left front seat while the other observer was positioned in the right rear seat. The pilot navigated along a pre-determined route (Appendix 1) which had been delineated on 1:250,000 topographic maps. The original survey route (see Appendix 1, McCormick and Arner 1986) was altered to include additional shoreline habitats along Pelly Lake, Upper Garry Lake, Garry Lake, Lower Garry Lake, Bulliard Lake, Upper and Lower Macdougall lakes, and Deep Rose Lake. The transect was positioned to maximize the area surveyed on either side of the land/water interface. The survey route was segmented into 10-km units to facilitate the recording of data. The boundaries of the original transect units were retained wherever possible. However, as a result of adjustments to the 1984 transect, some units were less than 10 km long. These units were: B40, B60, and C54. The size

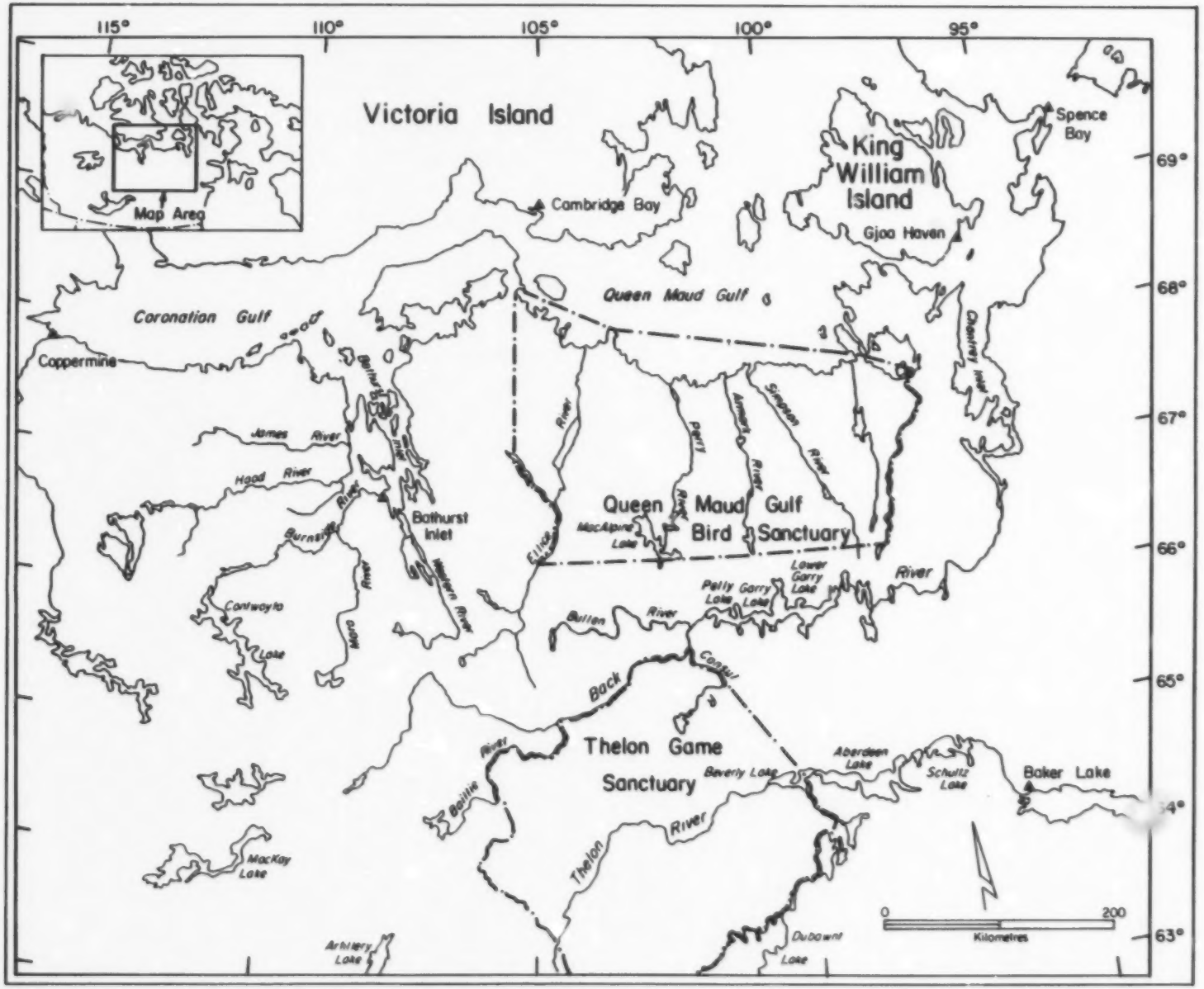


Figure 1. Location of the study area within the Northwest Territories.

and identity of all goose flocks within the transect were noted. Observations on other wildlife (Appendices 2 and 3) were collected as time permitted. All observations were recorded on a tape recorder and later transcribed onto appropriate data sheets.

The size of Lesser Snow Goose colonies was estimated through visual estimates, parallel transects, and oblique photographs, as appropriate.

4.0 RESULTS

4.1 Canada Geese

4.1.1 Distribution and Abundance

Moulting Canada Geese occurred along much of the survey route which lies east of Bathurst Inlet (Fig. 2). Birds were encountered continuously from near Beechy Lake (105°30'W) to Chantrey Inlet. The lower reaches of the Baillie, Jervois (65°25'N, 103°16'W), Consul, and Bullen rivers were also occupied. The Ellice River was continuously occupied northward from approximately 66° N whereas scattered flocks were noted in southern Bathurst Inlet. Two birds were observed on the Hood River. Birds were also observed in inland areas, particularly between the Back and Ellice rivers and between the Ellice and Anjimajuq (68°11'N, 106°20'W) rivers (Appendix 1).

A total of 32,031 Canada Geese were recorded during the survey (Appendix 2). The approximate distribution was: Back River system - 27,420; Ellice River - 3,250; Hiukitak River (67°08'N, 107°15'W) - 464, Bathurst Inlet - 73; and inland areas - 824.

In addition to the planned survey, approximately 25 km of survey was flown along an unnamed river which empties into the Ellice River at approximately 66°48'N. This survey revealed a total of 2,079 geese.

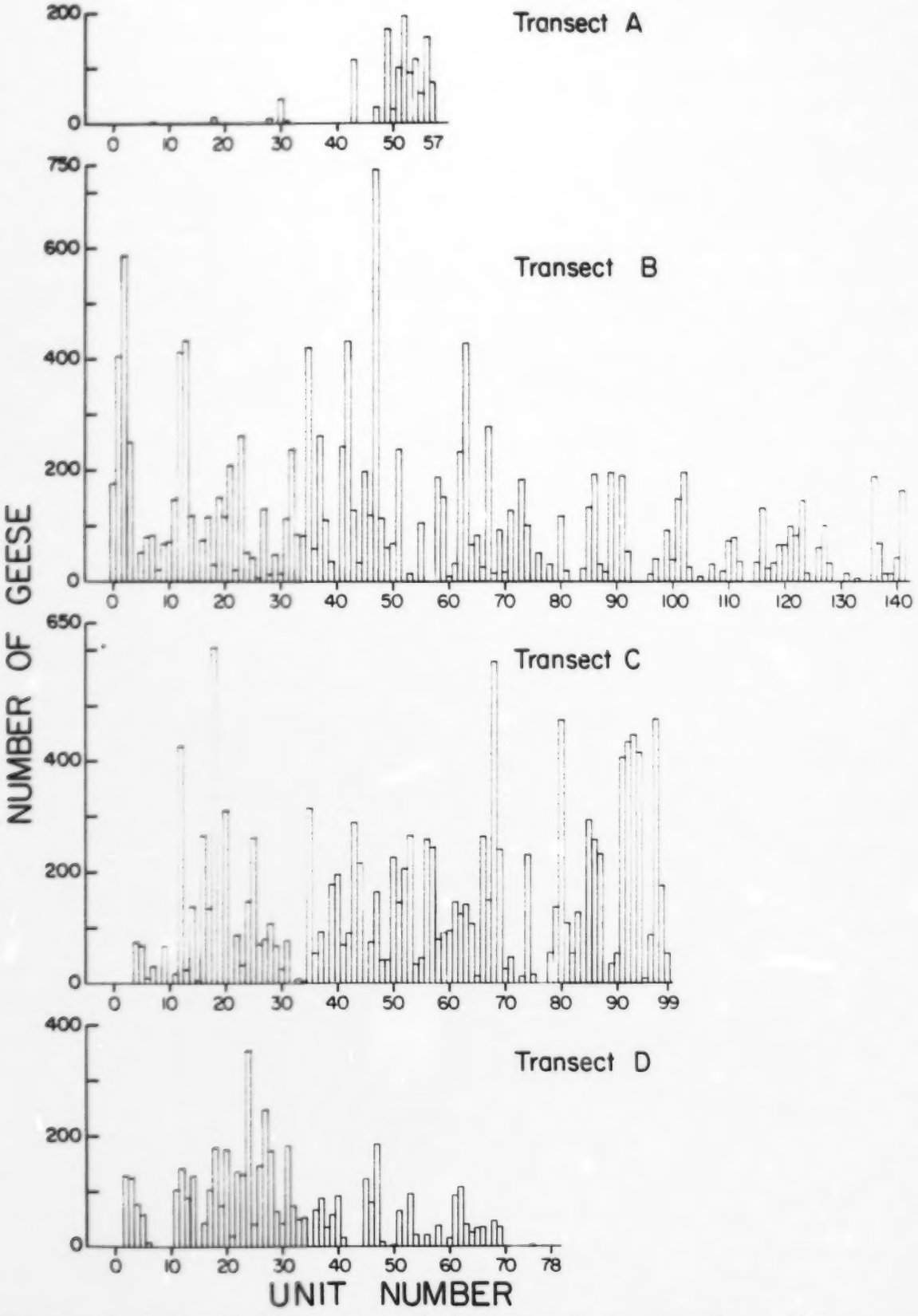


Figure 2. Distribution of moulting Canada Geese along the survey route, July 1986.

4.1.2 Breeding Distribution

Only one brood, in unit B41, was observed during the survey.

4.2 Lesser Snow Geese

4.2.1 Distribution and Abundance

A total of 3,342 adult Lesser Snow Geese were recorded during the survey (Appendix 2). Additional blue-phase birds may have been overlooked due to their cryptic colouration. This total includes birds seen at colonies 1 and 2 (see below) on the Ellice and Back rivers respectively. A further estimated 1,400 - 1,600 pairs were observed at or near four additional colonies (see below) on Back River, Pelly Lake, and Upper Garry Lake. The density of birds at these colonies precluded their individual enumeration.

Principal areas of concentration included: Ellice River - 245, Back River system from 65°10'W to lower Garry Lake - 3,000-3,400, and lower Back River - 618. Adults were accompanied by young in all of these areas (see below). Single, large flocks of moulting birds occurred in transect units D51 (159 birds) and D33 (100 birds). The remaining birds were scattered in small flocks along the Back and Ellice rivers.

4.2.2 Breeding Distribution

A total of six Lesser Snow Goose colonies were discovered during the survey. Details of the colonies are:

Colony No. 1: A colony of 50-60 pairs was located on three small islands in the Ellice River (UTM Grid: EF 340 220) which were surrounded by rapids. This total included 23 pairs with young and at least 38 other adults. Fifteen nests still contained eggs.

Colony No. 2: A total of 44 adults were seen along the Back River from approximately 103°30'W to the mouth of the Jervoise River. This total included five pairs with young and another five pairs which appeared to have young but were too far away for positive confirmation. The exact location of this apparent colony was not determined as no nests or incubating birds were seen. However, a number of islands and peninsulas, in this stretch of the river, appeared to be suitable colony sites.

Colony No. 3: Approximately 150-200 pairs nested on an island (UTM Grid: LJ 635 087) in Back River, just below the mouth of Bullen River. An estimated 120 pairs were present on the island when it was visited on 11 July. However, several broods were leaving the colony and numerous others were in its immediate vicinity. Accordingly, the above estimate seems reasonable. Observed clutches averaged 2-3 eggs and no observed broods consisted of more than three young. The colony consisted of approximately 5% blue-phase birds.

Colony No. 4: An estimated 400-500 pairs nested on an island (UTM Grid: LJ 735 180) near the mouth of the Back River. A series of parallel transects revealed a total of 143 nesting pairs, and numerous other vacated nests. The island was surrounded by numerous pairs with broods; hence the above estimate. Nesting was concentrated on the higher ridges (less than 5 m above the water level) of the island.

Colony No. 5: An island at the west end of Pelly Lake (UTM Grid: LJ 815 190) was occupied by approximately 600 pairs. This estimate was derived from photographs of the colony. However, numerous broods near the island suggested that the actual number was probably much higher. As at Colony No. 3, the majority of the birds were concentrated on the dry ridges of the island.

Colony No. 6: An estimated 250-300 pairs were concentrated on three islands on the west side of Upper Garry Lake (UTM Grid: MJ

035 200). Numerous other pairs with young, in the surrounding waters, indicated that the colony may have been considerably larger.

4.3 Significant Ancillary Observations

4.3.1 Falcons

Falcons were encountered on five occasions during the survey. Location and details are as follows:

A13: A pair of Peregrine Falcons was observed at Wilberforce Falls.
A32: A single Grey-phase Gyrfalcon was observed near an apparently unsuccessful nest.
B15: One adult Peregrine Falcon was seen at Hawk Rapids (65°34'N, 103°16'W).
D25: A male Peregrine Falcon flew off a cliff ledge in this transect unit.
D36: A single Peregrine Falcon was observed in this unit.

5.0 DISCUSSION

5.1 Regional Spring Weather

By all accounts, arctic Canada experienced a "late" spring in 1986. Satellite imagery revealed that Banks Island was completely covered with snow on 13 June and it was still 25% snow covered on 24 June. MacKenzie and Anderson bays and Queen Maud Gulf were all completely frozen until late June. This was the latest spring since 1972 (R. Kerbes, CWS pers. comm. with R. Reynolds, USFWS). Jenny Lind Island was completely snow covered on 13 June and no geese were seen in the Queen Maud Gulf Bird Sanctuary on 9 June (A. Gunn, DRR, pers. comm.). The area around Brichta Lake (67°46'n, 104°50'W) was still 95% snow covered on 12 June (D. Heard, DRR, pers. comm.). The general snow line on June 7, as compared to 1984 and an "early" year is shown in Figure 3. In 1986, virtually all areas north of the snow line were snow covered and temperatures were well below

normal (Anon. 1986).
Impacts of the late spring were still evident during the survey. Bathurst Inlet, south of Burnside Bay, was covered by extensive sheets of rotten ice whereas south of Young Point it was covered by solid ice. Open water margins of 5-10 m were present along the shorelines in this area. The northern arm of Garry Lake was covered with extensive ice as was the centre of Lower Garry Lake. Much of the bay from units B67-72 was covered by rotten ice with a 50 m margin of open water. Small bays and coves were completely ice-covered. All of Deep Rose Lake was covered with solid ice except for 30-40 m margins of open water around islands and along the mainland. The bays adjacent to units B101-103 and Franklin Lake were almost completely ice-covered.

Further evidence is available from the recorded water levels and break-up dates on the Ellice, Baillie, and Back rivers (Table 1). These data suggest that spring weather phenology was at least a week later than normal. However, calculated nest-initiation dates suggest that the season was approximately two weeks late. The later determination is consistent with the observations of the residents at Cambridge Bay (T. A. Blake, pers. comm. with W. Spencer, CWS).

5.2 Canada Geese

5.2.1 Distribution

The Back River has been known as a major goose moulting area for over a century (see McCormick and Arner 1986). Dzubin et al. (1980) identified the following areas of concentration: 1) Baillie River to Jervois River, 2) McKinley River (65°30'N, 102°23'W) to Pelly Lake, 3) southern bays of Pelly, Upper Garry, and Lower Garry lakes, and 4) Herman River (66°14'N, 60o07'W) to Franklin Lake.
The 1984 survey confirmed these approximate areas of concentration although flocks were also sparsely distributed along the rest of the survey route. In 1986, flocks were more evenly distributed along the entire survey route as more transect units were occupied

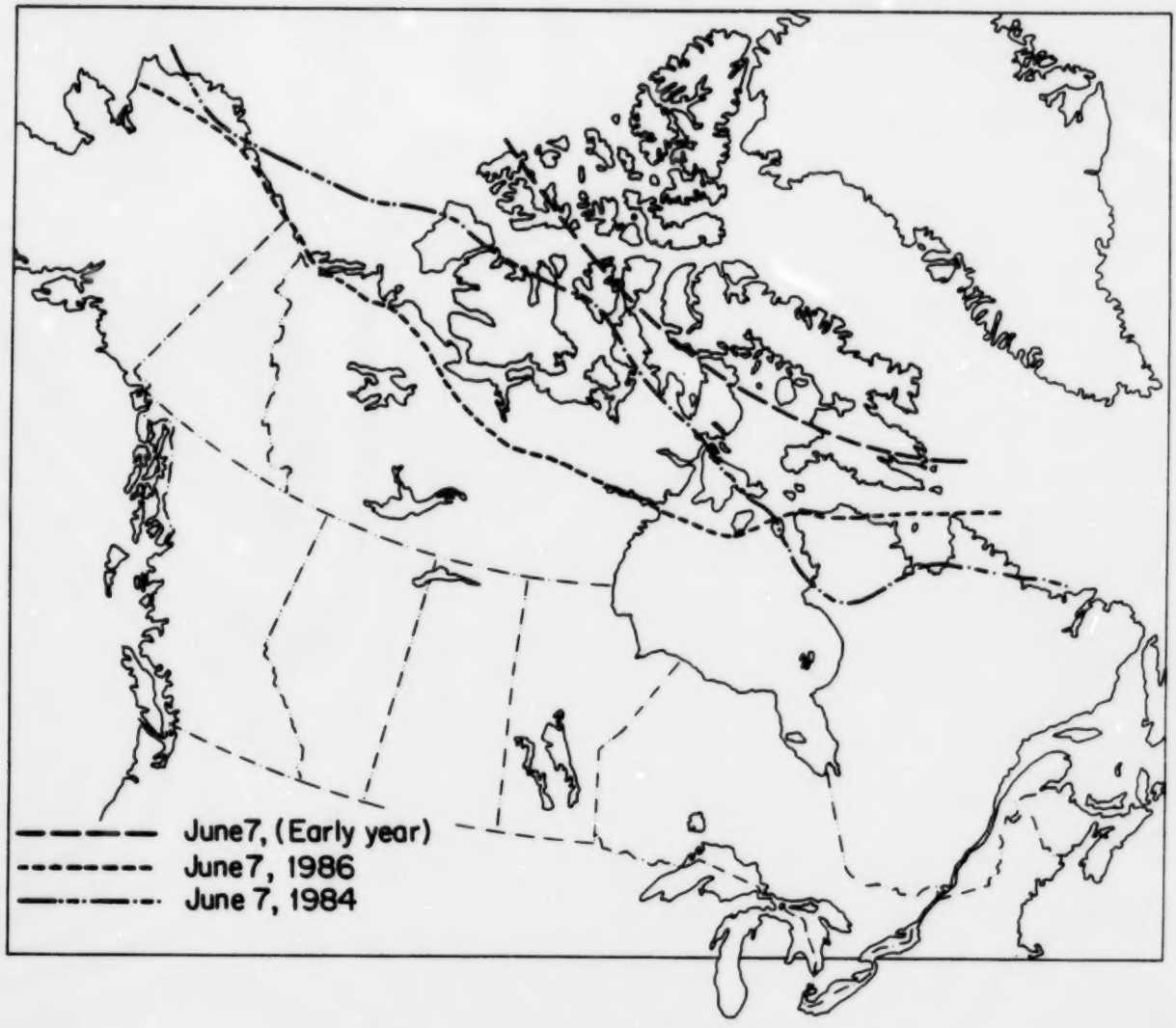


Figure 3. Location of Arctic Canada snowline on 07 June, 1986. (from Anon. 1986).

Table 1. Water levels and break-up dates on the Ellice, Baillie, and Back rivers, 1986.

	Ellice River (67°72'N, 104°08'W)	Baillie River (65°02'N, 104°31'W)	Back River (66°05'N, 96°30'W)
Historic mean water level (m) - 12 July [1]	4.729	5.386	5.710
Water level (m) - 12 July, 1986	5.210	5.915	6.989
Water level deviation from historic mean (m)	+.481	+.529	+1.279
Historic mean breakup date (N)	12 June (7)	10 June (8)	21 June (10)
Breakup date - 1986	14 June	19 June	27 June

1 - mean date of 1986 moulting goose survey.
N = number of years of data

in 1984 and 84% (N=99) were occupied in 1986. Although some differences in the "percent occupation" may be attributed to the inclusion of additional prime habitat in the 1986 survey, it is apparent that marginal habitats (see section 5.1.4; McCormick and Arner 1986) were also occupied. The lower reaches of the Baillie River were also occupied; but were almost vacant in 1984. Similarly, the Consul River was much more completely occupied in 1986. The lower Back River, from Lower MacDougall Lake to Franklin Lake was also more completely occupied.

The occupation of the Ellice - Hiukitak river transect units (D) increased from 63% (N=68) in 1984 to 77% (N=70) in 1986. As along the Back River system, increased occupation occurred in areas of marginal habitat - upper Ellice River (units 11-13) and Hiukitak River. Although no geese were seen at Portage Bay or "Moult Lake" (66°57'N, 108°21'W), ten birds were seen near the mouth of the Western River.

Moulting birds were not only more widely distributed, they were also more numerous. The numbers of birds observed within the same transect units, during the 1984 and 1986 surveys, are summarized in Appendix 4. The total increase within each transect is: Transect A-334%, Transect B-210%, Transect C-310%, and Transect D-240%. The increased distribution and numbers of moulting birds may be attributed to the marked increase in numbers of geese which occupied the study area (see below) in 1986.

5.2.2 Abundance

An estimate of abundance is complicated by two principal factors - the inherent biases in aerial surveys and the amount of available habitat which was not surveyed. The 1986 survey route was adjusted to include habitat which was not surveyed in 1984. Although these "adjustments" did not include all available habitats, they did provide relatively complete coverage of the Back River system. Additional factors include: 1) the predisposition of some moulting

geese to "freeze" in response to anticipated danger (helicopter), and 2) no measure of observer accuracy in determining flock sizes.

Aerial surveys underestimate animal density (Stott and Olson 1972, Caughley 1974, Haddock and Evans 1974, Savard 1982). There are no published visibility correction factors available for flocked, moulting geese (A. Dzubin, CWS, pers. comm.). Haddock and Evans (1974) recommend a conversion factor of two for helicopter surveys of dispersed, breeding Canada Geese whereas a factor of 2.02 (mean of 15 simultaneous aerial and ground surveys) was derived for fixed-wing aircraft surveys of wintering waterfowl (Stott and Olson 1972). The clumped distribution of these species would approximate the distribution of flocks of moulting geese. Accordingly, a conversion factor of "two" has been used when estimating total moulting goose abundance along the survey route. With regard to unsurveyed areas, the mean number of moulting birds per transect unit in adjacent surveyed habitats was determined and applied to the unsurveyed areas.

The following abundance estimates must be interpreted in light of the above considerations.

5.2.2.1 Back River System

The Back River system includes the survey route from Beechy Lake (B41) to its eastern extremity beyond the outlet of Franklin Lake (see Appendix 1). As a result of problems with a tape recorder, one observer's data for units C52-78 were lost. Each observer's data was compared for the ten previous units (C42-51) and the ten subsequent units (C79-88) to determine an appropriate compensation factor. The individual totals were 1,583:1,438 or a factor of 1.06. Accordingly, the recorded number of geese in units C52-78 was doubled to compensate for the lost data. The estimated total population of Canada Geese on the Back River system is 27,420 (observed birds) + 3,463 (estimated number from partially surveyed area) = 30,883 X 2 (visibility correction factor) = 61,766 birds.

This total is approximately three times the estimated total number of birds which were present in 1984.

5.2.2.2 Ellice River

Ellice River includes the survey route from unit D12 to unit D48. The west side of Ellice River, opposite units D12-34, was not surveyed. Assuming that the east and west shorelines supported similar densities, 2,643 geese were present on the west side. The estimated total population on the Ellice River is 3,391 (observed birds) + 2,643 (estimated number from unsurveyed area) = 6,034 X 2 (visibility correction factor) = 12,068 birds. As on the Back River system, the estimated number of Canada Geese present is approximately three times the 1984 estimates.

5.2.3 Influence of Spring Weather

Moulting Canada Geese arrive in the study area during late June (Dzubin et al. 1980). In addition to known concentrations, small flocks are widely scattered on lakes and streams between the major river systems (Dzubin et al. 1980; pers. comm.). As indicated above, much of the study area was covered by snow during mid to late June. Moreover, the lakes and ponds had a persistent ice cover, long after the snow melted. Such ice-bound water bodies would offer little or no escape habitat to moulting geese. Therefore, it appears that many of the geese which use these peripheral moulting areas converged on the only open-water areas in the region. (Advanced break-up on larger rivers is due to water currents; relatively immobile water bodies such as bays also break-up late). Hence the large number of moulting birds recorded and their relatively extensive distribution along the rivers. The number of birds recorded in 1986 is probably a reasonable reflection of the birds which moult on the rivers and in their adjacent drainage systems. However, the short survey adjacent to the Ellice River (section 4.1.1) suggests that relatively small patches of good habitat can support impressive numbers of geese.

5.2.4 Key Habitat sites

Key Habitat Sites (see section 1.1) within the study area include: Queen Maud Gulf, Middle Back River, and Lower Back River (McCormick et al. 1984).

5.2.4.1 Ellice River

As discussed previously (McCormick and Arner 1986), the Ellice River deserves recognition as a Key Habitat Site. The estimated 12,000 birds which occurred along this river are a significant component of the large Canada Goose (maxima-moffitti) population. A number of adjoining rivers also appear to support significant numbers of Canada Geese. Although presently included within the Queen Maud Gulf Key Habitat Site, it merits individual recognition with regard to Canada Geese.

5.2.4.2 Middle Back River

This site includes the Back River from the mouth of the Baillie River downstream; including Pelly Lake, Upper Garry Lake,and Lower Garry Lake to 99° W (McCormick et al. 1984, McCormick and Arner 1986).

Twenty thousand four hundred and sixty-seven geese were observed during this survey. Therefore, the estimated total population for this site is 20,467 (observed birds) + 2,643 (estimated from unsurveyed area) = 23,110 X 2 (visibility correction factor) = 46,220 birds. This number represents approximately 75% of the estimated total population on the Back River system.

5.2.4.3 Lower Back River

This site includes the lower Back River from the mouth of Herman River downstream along Franklin Lake to the mouth of Hayes River and north to Cockburn Bay (McCormick et al. 1984).

One thousand and thirty-four geese were recorded during this survey which covered approximately half of the shoreline within the site. Therefore, the estimated population for the surveyed area is 1,034 (observed birds) X 2 (visibility correction factor) = 2,068 birds. An estimate of the population within the whole Key Habitat Site must await a more extensive survey.

5.2.5 Breeding Distribution

Only one Canada Goose brood was observed (in B41) although a few other nests were noted among the Lesser Snow Geese in Colony No. 6 (see above). These results differ markedly from the 1984 survey when 25 broods were encountered. However, such limited production was expected in light of the late snow-melt and break-up in 1986. McCormick and Arner (1986) suggested that much of the apparently suitable breeding habitat along the Ellice and Back rivers is flooded during the breeding season and that breeding geese are restricted to habitats which are above the high-water mark of these rivers. The persistent snow cover of 1986 would have also eliminated these habitats.

5.3 Lesser Snow Geese

5.3.1 Distribution and abundance

5.3.1.1 Ellice River

A total of 250 adult Lesser Snow Geese, including at least 20 pairs with young, were observed along the Ellice River. A few pairs and lone birds were scattered along the upper reaches of the river and two larger flocks (presumably moulting birds) totaling 100 birds were seen at approximately 67°25'N. Other large flocks of moulting birds were seen west of the river (D51).

One hundred and eighteen adults, including at least 15 pairs with young, were observed near the colony at unit D44. An additional 23 pairs with young were on the colony site and at least 15 nests

still contained eggs. Ten pairs and 43 young were seen in the vicinity of this colony in 1984. It was then hypothesized that these geese had originated from nearby known colonies (Kerbes et al. 1983). It now appears that the geese, seen in 1984, may have originated from this previously unknown colony. The significant increase in numbers, since 1984, may reflect the limited nesting habitat which was available at traditional colony sites in 1986.

5.3.1.2 Middle Back River

Lesser Snow Geese occurred along the middle Back River from near the mouth of the Jervois River to the east end of Garry Lake. The main concentrations, however, were encountered from the mouth of the Bullen River eastward.

A total of 34 adults and an undetermined number of young were seen along the Back River, just upstream from the mouth of the Jervois River. The exact location of this apparent colony was not determined as no nest or incubating bird was observed. No birds were seen in this area in 1984.

An estimated 4,396 adult geese were observed between the mouth of the Bullen River and the east end of Garry Lake. This total included 1,684 breeding pairs (with young, or incubating) and 1,028 apparently non-breeding birds. The latter number included 244 moulting birds. The breeding birds concentrated at or near four colonies (see above) which ranged in estimated size from 120 to 600 pairs. Breeding Lesser Snow Geese were first reported from this area in 1984 (McCormick and Arner 1987). A total of 362 adults and 55 young were observed although many more young, intermingled with large flocks of adults, were present but could not be counted. The exact location of the breeding colonies was not determined as the survey was conducted from 23-26 July; well after the birds had dispersed from their colonies.

There has been a dramatic increase in the number of breeding Lesser Snow Geese in this area, since 1984. However, much of this

increase may have been due to the poor conditions at the traditional sites in the Queen Maud Gulf Bird Sanctuary (see below). McCormick and Arner (1987) suggested that the Pelly - Lower Garry Lakes area appeared to be good breeding habitat and that these colonies would likely expand. If these geese return to breed in the Pelly - Lower Garry lakes area, instead of the Queen Maud Gulf colonies, the numbers in this area could increase quite rapidly.

5.3.1.3 Lower MacDougall Lake

A total of 101 adult birds, including 33 moulting birds, were observed along the Back River between Lower Macdougall Lake and approximately 98° W. No young were seen. A flock of 14 non-breeders was seen in this area in 1984. The influx of birds into this area in 1986, was probably due to the large number of failed or non-breeders at nearby colonies. As most of these birds were not moulting they would seem to be failed breeders rather than immature birds.

5.3.1.4 Lower Back River

Lesser Snow Geese were observed along the lower Back River from the mouth of the Montressor River to the mouth of Mistake River. A total of 612 adults, including 38 moulting birds were observed. This is a significant increase over the 403 adults and associated young which were observed in 1984 (McCormick and Arner 1986). No young were observed during this survey. Apparently no breeding occurred as a result of the persistent snow cover in this area.

5.3.2 Influence of Spring Weather

Lesser Snow Geese arrive at the Queen Maud Gulf colonies in early June (Ryder 1967) and begin nesting as soon as sites are snow - free. The modal date of nest initiation is 9-10 June (Ryder 1967). Egg laying consumes 5-6 days and incubation takes a further 22-23 days (Godfrey 1986). Hatching, therefore, usually occurs about 6-8

July. Lesser Snow Goose colonies were in mid-hatch when we visited them on 11-12 July. Many pairs were still incubating eggs which were pipping, and numerous broods were in the waters adjacent to the colonies. Lesser Snow Goose breeding phenology was approximately one week late in 1986.

Also, it appears that the late spring was responsible for Lesser Snow Geese "colonizing" the Pelly-Lower Garry lakes area. As their traditional breeding sites were snow-covered when they arrived, the geese probably turned to the nearest area of suitable habitat. The Pelly-Lower Garry lakes area is at least 80 km from the nearest colony in the Queen Maud Gulf Bird Sanctuary (Kerbes et al. 1983). Therefore, snow cleared from these sites earlier than at the more northern traditional sites (see Fig. 3).

It remains to be seen whether the occupation of this area, in response to inclement habitat conditions farther north, will become permanent.

6.0 LITERATURE CITED

Anonymous. 1984. Status of waterfowl and fall flight forecast. U.S. Fish and Wildl. Serv. and Can Wildl. Serv. 29 pp.

Anonymous. 1986. Status of waterfowl and fall flight forecast. U.S. Fish and Wildl. Serv. and Can. Wildl. Serv. 36 pp.

Caughley, G. 1974. Bias in aerial survey. J. Wildl. Manage. 38: 921-933.

Dzubin, A.X., R.T. Sterling, and E. Kuyt. 1980. Large Canada Geese moulting in the Northwest Territories. Unpubl. Rept., Can. Wildl. Serv., Saskatoon. 59 pp.

Godfrey, W.E. 1986. The birds of Canada. Revised Edition. Nat. Mus. Can., Ottawa. 595 pp.

Haddock, J.L. and C.D. Evans. 1974. Spring bird populations on Alaska's arctic slope. Unpubl. Rept., U.S. Fish Wildl. Serv., Anchorage. 44 pp.

Kerbes, R.H., M.R. McLandress, G.E.J. Smith, G.W. Beyersbergen, and B. Godwin. 1983. Ross' Goose and Lesser Snow Goose colonies in the central Canadian Arctic. Can. J. Zool. 61(1): 168-173.

McCormick, K.J., M.E. Adams, C.J. Stephenson, and A.S. Goodman. 1984. Key migratory bird terrestrial habitat sites in the Northwest Territories. Tech. Rept. 84-6, Can. Wildl. Serv., Yellowknife. 175 pp.

McCormick, K.J. and B.D. Arner. 1987. Lesser Snow Geese breeding in Pelly - Lower Garry Lakes area, interior Keewatin District, Northwest Territories. Can. Field Natur. 101:605-606.

McCormick, K.J. and B.D. Arner. 1986. A survey of moulting Canada Geese in the Bathurst Inlet and Back River areas. Northwest Territories. Unpubl. Rept., Can. Wildl. Serv., Yellowknife. 62 pp.

Ryder, J. P. 1967. The breeding biology of Ross' Goose in the Perry River region, Northwest Territories. Rept. Ser. No. 3., Can. Wildl. Serv., Ottawa. 56 pp.

Savard, J.P.L. 1982. Variability of waterfowl aerial surveys: observer and air-ground comparisons - preliminary report. Prog. Note No. 127, Can. Wildl. Serv., Ottawa. 6 pp.

Stott, R.S., and D.P. Olson. 1972. An evaluation of waterfowl surveys on the New Hampshire coastline. J. Wildl. Manage. 36: 468-477.

7.0 APPENDICES

Appendix 1. Route of moulting goose survey, July 1986.

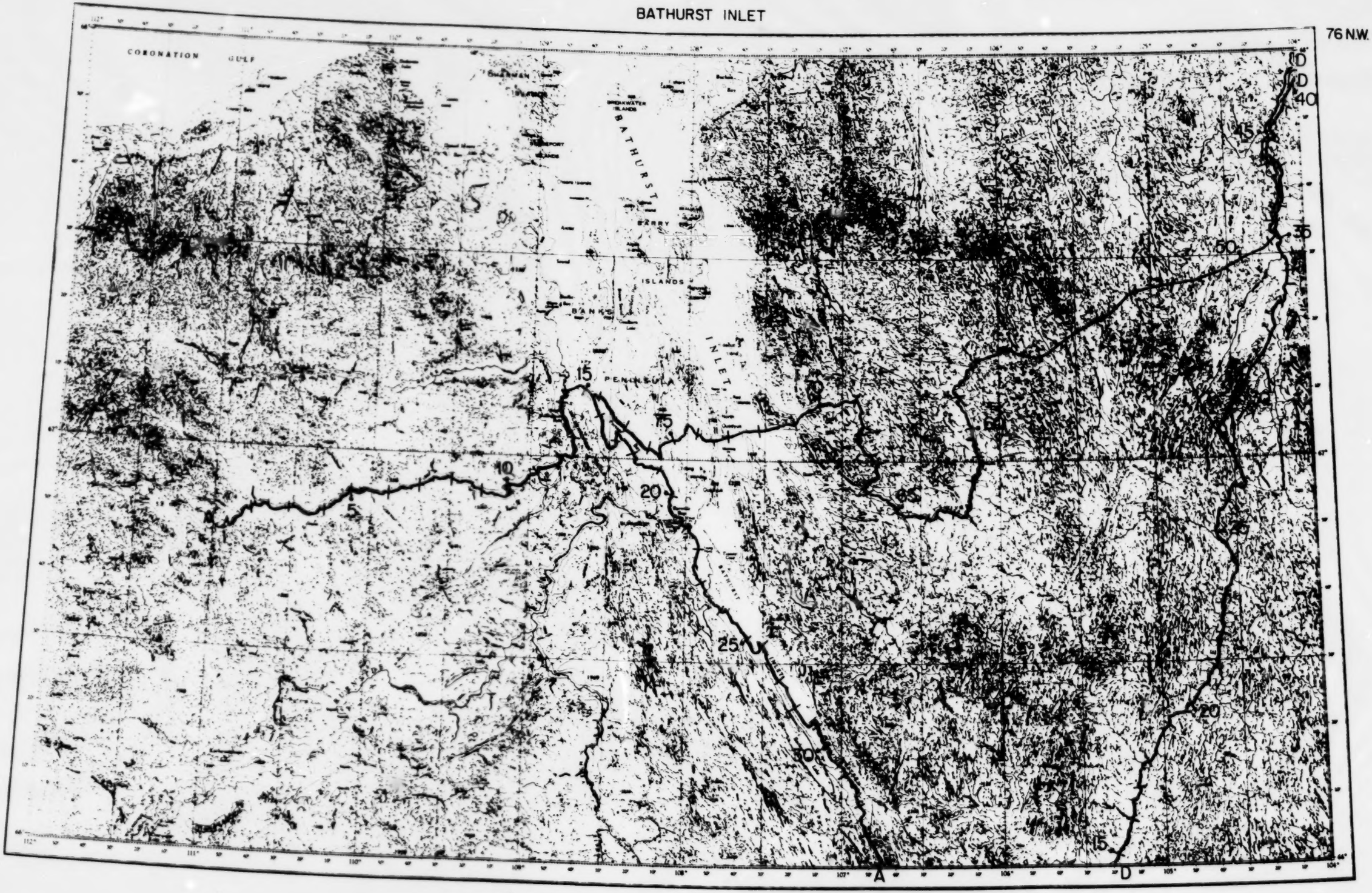
Sectors of the survey route were flown on the following dates:

A - 23, B - 24, C - 25, D - 26, E - 27, F - 28.

- base camp
- fuel cache

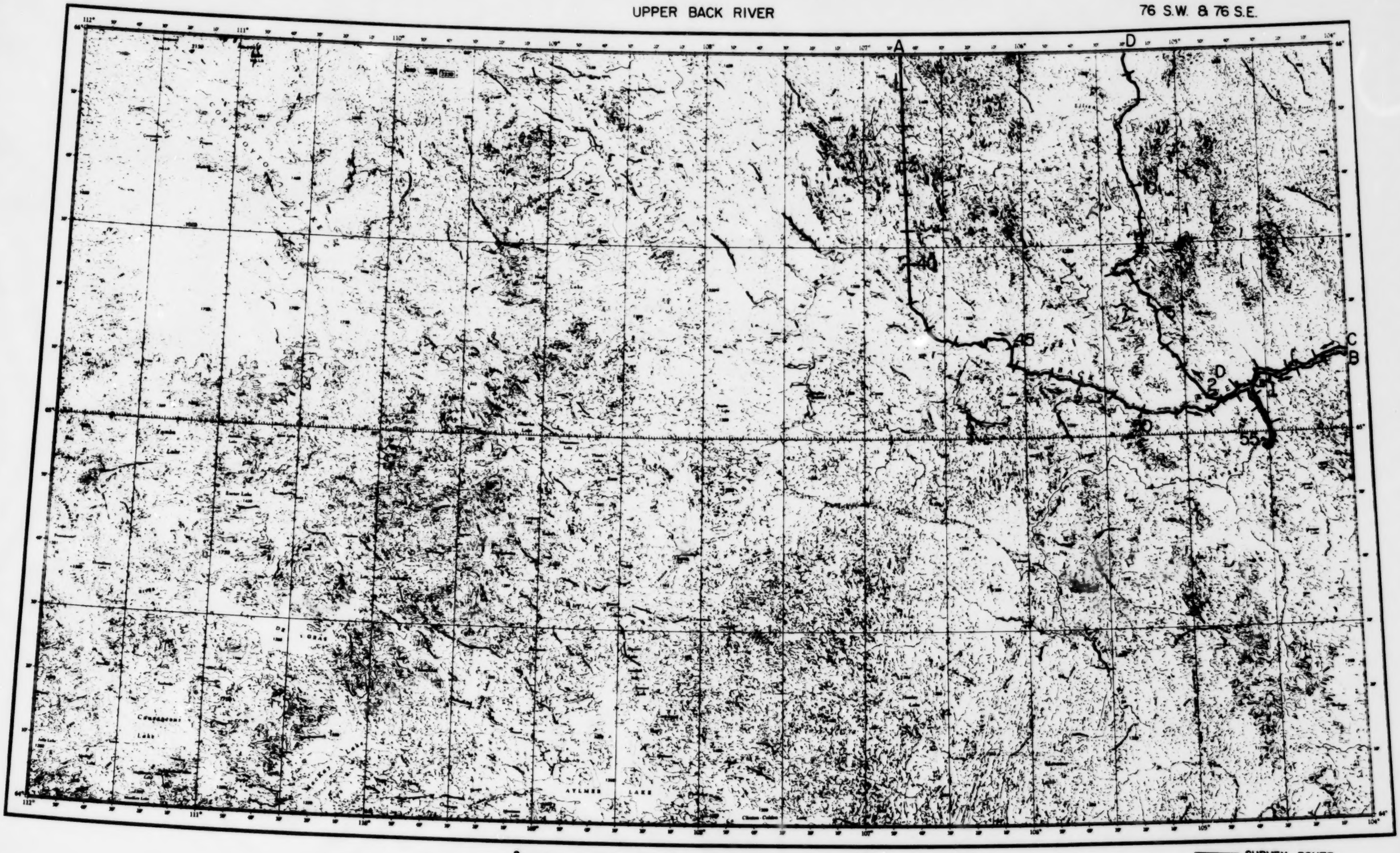
BATHURST INLET

76 N.W. & 76 N.E.



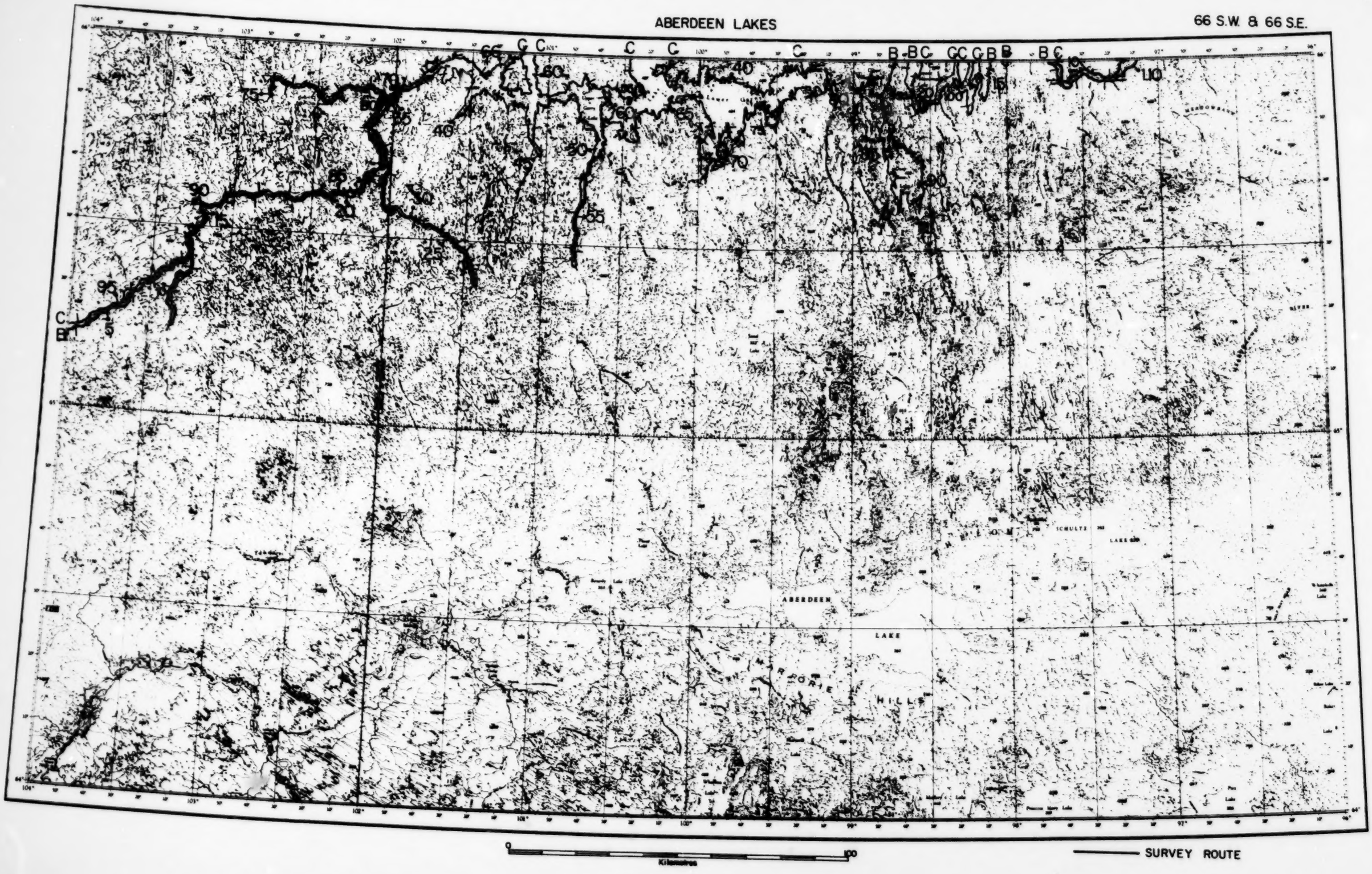
UPPER BACK RIVER

76 S.W. & 76 S.E.



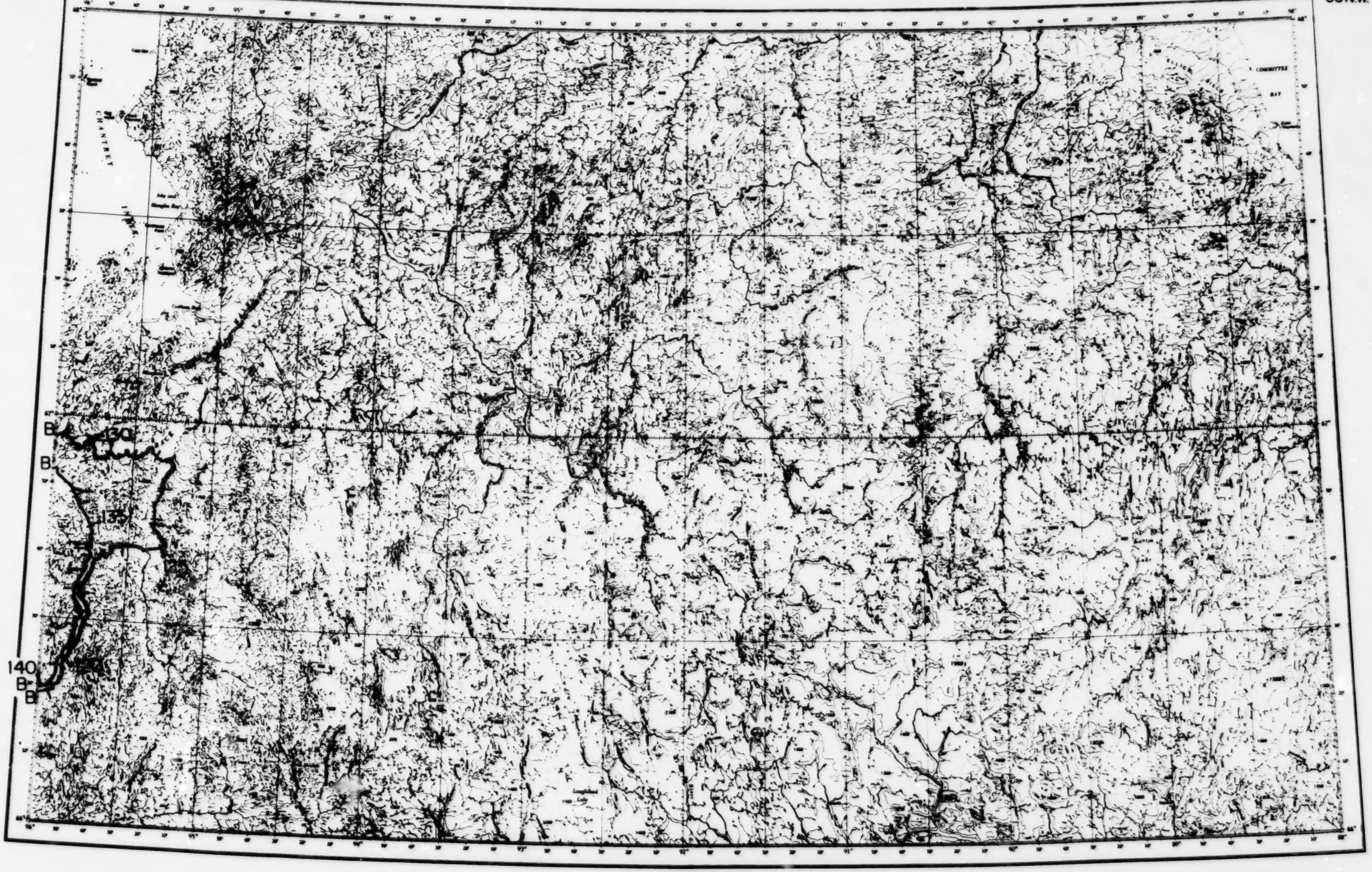
ABERDEEN LAKES

66 S.W. & 66 S.E.



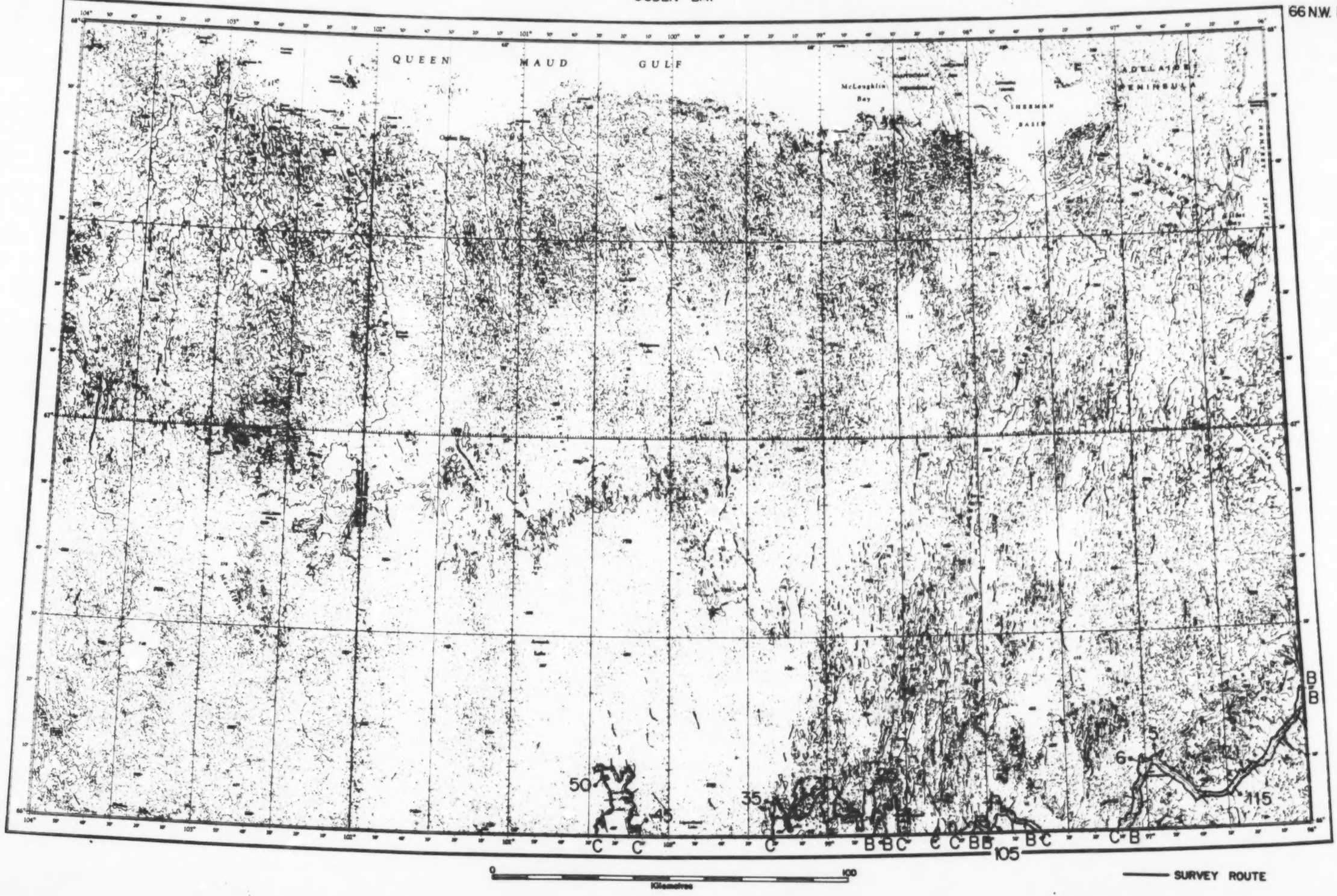
CHANTREY INLET

56 N.W. & 56 N.E.



OGDEN BAY

66 N.W. & 66 N.E.



Appendix 2. Summary of bird observations, July 1986.

The species observed during the survey were: Red-throated Loon (RTLO), Pacific Loon (PALO), Tundra Swan (TUSW), Greater White-fronted Goose (GWFG), Snow Goose (SNGO), Canada Goose (CAGO), Scaup (SCAP), Oldsquaw (OLDS), Common Merganser (COMG), Red-breasted Merganser (RBMG), Rough-legged Hawk (RLHA), Peregrine Falcon (PEFA), Sandhill Crane (SACR), Parasitic Jaeger (PAJA), Long-tailed Jaeger (LTJA) and Arctic Tern (ARTE).

Also observed were two Short-eared Owls (Units A24, B95), approximately one hundred and fifty Northern Pintails (Unit D4, D41), twelve Brant (Unit D41), and several female Eiders (Units D23, D40, D43, D53). Gulls were also commonly seen along the transects.

SYMBOLS:

()	number of moulting geese
[]	identified to genus only
C	colony
m	males
f	females
p	number of pairs
y	number of young
py	number of pairs with an unspecified number of young
-	numbers not followed by a letter, represent numbers of adult birds observed.

Appendix 2. Continued.

Date: 11 July 1986
Transect: A

Unit No.	Species															
	RTLO	PALO	TUSW	GWFG	SNGO	CAGO	SCAP	OLDS	COMG	RBMG	RLHA	PEFA	SACR	PAJA	LTJA	ARTE
3									1m	3						
4									1m							
7						2										
12			1	1												
13												1p				
15	[1]						50									
16							14		1,2y							
17			1	1												
18	[1]	1	5			12			4							
21			2													
24	1[1]															
25									[1m]							
27									[1p]							
28						10										
30						45										
31						5										
32											1,3y					
36								2								
41									5m							
43						117										C
46									2m							
47						30			[1]3m	3m						6-10
48																5
49						174			1m							
50						31			1f							
51						102										4
52	1					196			[2m]							
53						93			[1m]							
54						118		2								
55						55			[1m]	[2f]						
56	[1]					158										
57						75										

Date: 13 July 1986
Transect: A (observations made on return flight from transect D)

Unit No.	Species															
	RTLO	PALO	TUSW	GWFG	SNGO	CAGO	SCAP	OLDS	COMG	RBMG	RLHA	PEFA	SACR	PAJA	LTJA	ARTE
12									2m							
8											1					
5											1					

Appendix 2. Continued.

Date: 11 July 1986
Transect: B

Unit No.	Species															
	RTLO	PALO	TUSW	GWFG	SNGO	CAGO	SCAP	OLDS	COMG	RBMG	RLHA	PEFA	SACR	PAJA	LTJA	ARTE
0						177			1m							
1						405			2m	1m						
2	1					588								1		
3						250			3m					(8)		
5					2	52								1		
6						80										
7						84										
8					4	20										
				2p4y												
9						67										
10						71			1m							1
11						148										
12						414		4	3f1m							1
13						433										1
14						118		3	2m							
15											1	1				
16					4	75										
17						116										
18						25										
19						151			(2)						1	
20						116										
21						209										
22						20										
23						261										
24						51		2	2m		1					
25						42										
26						5				1m						
27						130										
28						11										
29						49				2m						
30						12										
31						113										
32						236										
33			3			83							4			
34					2p1	82										
35					35	420										
				67py												
36					59											
				(12)												
				32py												
37					12	262										
				(8)												
				38py												
38					32py	110										
39					7py	35				5						
40									1							
41					35	243		60								
				2py	1py											
42					90	427										
				(45)												
				13py												
43						127										
44					(12)	33										
45						198										
46						119										

Appendix 2. Continued.

Date: 11 July 1986
Transect: B continued

Unit No.	Species															
	RTLO	PALO	TUSW	GWFG	SNGO	CAGO	SCAP	OLDS	COMG	RBMG	RLHA	PEFA	SACR	PAJA	LTJA	ARTE
47					25	741										
					(93)											
48					9	113		2								
					(42)											
				44p												
49					6	60										
				(20)												
				11p												
50						68			7m							
51				12		236		3						2		
52			1													*
53						14		7								
54														1		
55						105										
58					2p23	188										
59					2py	151										1
				(12)												
60						9										
61						32										
62				26	15	232										
63				10		427										
64						65								1		
65			2		1	82										
66						25										
67				7		278										
68						14										
69						92										
70						15										
71						127										
73						183										
74						100										
75		1														
76						50										
78						30										
80						116										
81						18										
84						22										
85						134										
86						192		3								
87						30		2								
88						16		6								
89						95		2								
91						90										
92						53										
96						13										
97						40				5m						
99						91			2m							
100						39										
101		1			15	148										
102						195		35								
103						25										
105						8										
107						30										
109						18			30m							
110						72										

Appendix 2. Continued.

Date: 11 July 1986
Transect: B continued

Unit No.	Species															
	RTLO	PALO	TUSW	GWFG	SNGO	CAGO	SCAP	OLDS	COMG	RBMG	RLHA	PEFA	SACR	PAJA	LTJA	ARTE
111						77										
112						35										
115					4	34										
116						131										
117						22										
118						32										
119						65										
120						65										
121					1	99										
122						145										
123						145										
124						14				1						
126					16	60										
127			1		79	100										
				(38)												
128	1				323	32										
129					7											
130									[3]							
131					25	14										
132			4		91											
133			2			4										
136			4		12	187					1					
137					1	68										
138						13										
139						13										
140						41					1					
141					6	163										
142										7m						

* Several Arctic Terns

Appendix 2. Continued.

Date: 12 July 1986
Transect: C

Unit No.	Species															
	RTLO	PALO	TUSW	GWFG	SNGO	CAGO	SCAP	OLDS	COMG	RBMG	RLHA	PEFA	SACR	PAJA	LTJA	ARTE
4					7	75										
5						69							2			
6						10										
7						31				2m						
9						68				2m	1					
10													2			
11						18										
12					45	429										
				(11)												
13						25										
14					8	139							2			
				(12)												
15					4	5										
16	1				6	266										
17						135				7m						
18					5	606										
20					(6)	311			[1]						5	
22					(4)	88							2			
23						34										
24						148										
25	1					262										
26	[1]					71										
27						80										
28						109										
29						69										
30						26										
31						78										
32				3												
33						8										
34						4				3						
35					2	316							2			
36	2					55				2						
37					1	194										
38										1						
39						178										
40						196										
41						70										
42						92										
43					34	290										
44						216							2			
46					14	75										
47					12	165										
48						43				5m						
49		2				43										2
50						226				5m						
51	1					146										
52	[2]			12	35	182										
53		1			42	266										
54						35										
55						46										
56						260										
57				6	35	245										
58						88										
59					50	91										
60						95										

Appendix 2. Continued.

Date: 12 July 1986
Transect: C continued

Unit No.	Species														
	RTLO	PALO	TUSW	GWFG	SNGO	CAGO	SCAP	OLDS	COMG	RBMG	RLHA	PEFA	SACR	PAJA	LTJA	ARTE
61					24	146										
62					20	125										
				1p1y												
63					69	143										
				15py												
64					8	108										
				10py												
65					3	14										
				6py												
66					59py	265										
67					15	150										
				53py												
68					62	580				6						
				122py												
69					3py	241										
70					11py	26										
71					4	48										
73						13										
74						231			3m							
75						17										
78						56										
79						138										
80				5	40	475										
				38p												
				3py												
81					6	109										
82						55		4								
83	[1]					128										
85	1					295										
86						258				3m						
87						232			2m							
88	1															
89	1					35										
90						54										
91	2			1		407										
92			2		2p	435		2								
92					24											
				2py												
93					2	449										
				1py												
94						421										
95						9										
96					2py	88										
97			2			476		6								
98				37		175										
99						54		1								

Appendix 2. Continued.

Date: 13 July 1986
Transect: D

Unit No.	Species															
	RTLO	PALO	TUSW	GWFG	SNGO	CAGO	SCAP	OLDS	COMG	RBMG	RLHA	PEFA	SACR	PAJA	LTJA	ARTE
1									[1f]							
2						129										
3						125										
4					1p1	77										
5	[2]					58										
6									[8]							
7						7										
11						102										
12						141										
13					1p2	89										
14						128										
16						44			[1f]							
17						104			3m	2m						
18						179				3m						
19						74										
20						175										
21						19										
22					3	135										
23						130										
24						353										
25						41				1m		1m				
26					1p	146										
27		1				247										12p
28						173					1					
29						64										
30						42				2f1m				2		
31						183										
32						73										
33				55	100	50					1					
34						53				3m						
35								3								
36						66					1	1			1	
37	2			13		87		4			2					
38					9	35					1		2			
				5py												
39					1	58							1			
40			4	2		91							2			
41	5		16			16							1			
42			22													
43			5	26												
44			33	8	88											
				14py												
45	2		1		1py	122										
46			2			80										
47						185										
48						8					1					
49								9								
50						2										
51					159	65							1			
53				41		95							2			1p
54						21										
55													1p			
56						21				1m			3			
57															1	
58						38										

Appendix 2. Continued.

Date: 13 July 1986
Transect: D continued

Unit No.	Species														
	RTLO	PALO	TUSW	GWFG	SNGO	CAGO	SCAP	OLDS	COMG	RBMG	RLHA	PEFA	SACR	PAJA	LTJA	ARTE
60						15										
61						92										
62						83										
63						40										
64						25				3						
65						34				2						
66						35										
68						46				6						
69						35				4						
73										10						
75	2		3			1										
76			2	9												
77			4													
78			1													

Appendix 3. Summary of mammal observations, July 1986.

Date: 11 July 1986
Transect: A

Unit No.	Species				
	Wolf	Arctic Fox	Grizzly Bear	Caribou	Muskoxen
3					2
10					6
11					3
12					16
22					1
25				2+1	
29				1+1	
32			1	1	
35				4	
36				1	
46					10
47				1	

Date: 13 July 1986
Transect: A (observations made on return flight from transect D)

Unit No.	Species				
	Wolf	Arctic Fox	Grizzly Bear	Caribou	Muskoxen
11					1
10				150	
7					1
6	1				2
5	1				2
4				1	

Appendix 3. Continued.

Date: 11 July 1986
Transect: B

Unit No.	Species				
	Wolf	Arctic Fox	Grizzly Bear	Caribou	Muskoxen
5				1	
12			1		
16				2	
19				1	
24					8+3
25					1
31				1	
33					2
34					1
53				1	
58				1	
62		1			
82				1	
111				12	
127				1	
129					6+2*

* Sighted on 12 July 1986

Date: 12 July 1986
Transect: C

Unit No.	Species				
	Wolf	Arctic Fox	Grizzly Bear	Caribou	Muskoxen
25					1
26					1
32					1
35					2
39					1
40					1
43					5
51					5
61					1
80					1
83					1
90				1	15+2y

Appendix 3. Continued.

Date: 13 July 1986
Transect: D

Unit No.	Species				
	Wolf	Arctic Fox	Grizzly Bear	Caribou	Muskoxen
17					2
24					9
33					4
41				29	5
42					2
47					2
52					16+3
61					10
68				300-400	2
78					25+3

Appendix 4. Number of moulting Canada Geese observed on the same transect units, 1984 and 1986.

UNIT NUMBER				NO. GEESE	
	1984		1986	1984	1986
A	15		15		
	16		16	15	
	17		17	104	
	18		18		12
	19		19		
	20		20		
	21		21		
	22		22		
	23		23		
	24		24		
	25		25		
	26		26		
	27		27		
	28		28	7	10
	29		29		
	30		30	10	45
	31		31		5
	32		32		
	33		33		
	34		34		
	35		35		
	36		36		
	37		37		
	38		38		
	39		39		
	40		40		
	41		41		
	42		42		
	43		43		117
	44		44	28	
	45		45		
	46		46		
	47		47		30
	48		48		
	49		49	139+6[1]	174
	50		50	18	31
	51		51		102
	52		52		196
	53		53	22	93
	54		54		118
	55		55		55
	56		56		158
B	1	A	57		75

Appendix 4. Continued.

UNIT NUMBER		NO. GEESE	
1984	1986	1984	1986
B 2	B 1	163	582
3	2	1	588
4	3		250
	5	4	
6	5	4	52
7	6	119	80
8	7	40	84
9	8	54	20
10	9	263	67
11	10	115	71
12	11	71	148
13	12	42	414
14	13	18	433
15	14		118
16	15		
17	16	4	75
18	17	17	116
19	18		25
20	19	65	151
21	20	40	116
22	21	153	209
23	22		20
24	23	8	261
25	24		51
26	25		42
27	26		5
28	27	40	130
29	28	7	11
30	29		49
31	30	7	12
32	31	15	113
33	32	226	236
34	33	84	83
35	34	154	82
36	35	148	420
37	36		
38	37	158	262
40	41	220	243+1py[2]
41	42	173	427
42	43	184	127
43	47	360	741
44	48	159	113
45	49	32	60
46	50	237	68

Appendix 4. Continued.

UNIT NUMBER				NO. GEESE	
	1984		1986	1984	1986
B	47	B	51	69	236
	48		52	45	
	49		53		14
	50		54		
	51		55	73	105
	52		56	4	
	53		57	23	
	54		58	88	188
	55		62	103	232
	56		63	131	427
	57		64	63	65
	58		65	9	82
	59		66	71	25
C	2	C	2		
	3		3		
	4		4		75
	5		5	18	69
	6		6	34+3	10
	7		7	16	31
	8		8		
	9		9	4	68
	10		10	7	
	11		11		18
	12		12	122	429
	13		13	51	25
	14		14		139
	15		15	18	5
	34		55	379	46
	35		56	25	260
	36		57	63	245
	37		58	124	80
	38		59	73	91
	39		60	47	95
	50		69	14	241
	51		70	80	26
	52		71		48
	53		72	14	
	54		73		13
	55		74	20	231
	56		75		17
	57		76		
	58		77	61	
	59		78	50	56
	60		79	54	138

Appendix 4. Continued.

UNIT NUMBER				NO. GEESE	
	1984		1986	1984	1986
C	61	C	80	95+8	475
	62		81	26	109
	63		82		55
	64		83		128
	65		84	57	
	66		85	90	295
	67		86	8	258
	68		87	48	232
	69		88	28	
	70		89	4	35
	71		90	19	54
	72		91	2	407
	73		92	248	435
	74		93	125	449
	75		94	63	421
	76		95		9
	77		96		88
	78		97	24	476
	79		98	11	175
	80		99		54
D	1	D	1	67	
	2		2	10	129
	3		3	12	125
	4		4	8	77
	5		5	15	58
	6		6		
	7		7		7
	8		8		
	9		9		
	10		10		
	11		11		102
	12		12		141
	13		13		89
	14		14	2	128
	15		15	12	
	16		16	13	44
	17		17	12	104
	18		18	39	179
	19		19	70	74
	20		20	18	175
	21		21		19
	22		22	58	135
	23		23	17	130
	24		24	140	353

Appendix 4. Continued.

UNIT NUMBER		NO. GEESE	
1984	1986	1984	1986
D 25	D 25	25	41
26	26	45	146
27	27		247
28	28	50	173
29	29	52	64
30	30	2	42
31	31	17	183
32	32	4	73
33	33	23	50
34	34	70+4	53
35	35	23	
36	36	100+20	66
37	37	130+5	87
38	38	153+5	35
39	39	46	58
40	40	20+8	91
41	43	44+4	
42	44	200	
43	45		122
44	46		80
45	47		185
46	48		8
47	49		
48	50	84	2
49	51		65
50	52	27+4	
51	53	33	95
52	54	96+2	21
53	55	10	
54	56	8	21
55	57		
56	58	26	38
57	59		
58	60		15
59	61	24+2	92
60	62	43	83
61	63	14	40
62	64	7	25
63	65		34
64	66	22	35
65	67		
66	68		46
67	69		35
68	70		

Appendix 4. Continued.

UNIT NUMBER				NO. GEESE	
1984		1986		1984	1986
D	69	D	71		
	70		72		
	71		73		
	72		74		
	73		75		1

[1]+n = number of young
[2]py = number of pairs with an unspecified number of young